

Chicago Fed Letter

Using Payment Innovations to Improve Transportation Networks: A conference summary

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On June 12, 2007, Chicago Metropolis 2020 and the Federal Reserve Bank of Chicago jointly hosted a conference to discuss road pricing strategies, as well as other issues related to reducing transportation congestion and improving economic efficiency in the Chicago region and around the world.

Materials presented at the conference are available at www.chicagofed.org/news_and_conferences/conferences_and_events/2007_transportation.cfm.

In many urban areas in the U.S. and elsewhere, new road construction has ceased being a practical option to address rising congestion. Transportation authorities are increasingly turning to a variety of pricing mechanisms—from high-occupancy toll lanes (HOT lanes), which are free for carpools but tolled for solo drivers, to tolls around city centers that encourage the use of public transportation (as in London). Another initiative that relies heavily on new payment technologies is open road tolling, where tolls are paid electronically at highway speeds (e.g., in and around Chicago). Also critical to this debate are issues of who should own and manage transportation systems (public versus private), as well as how they should be funded.

Michael Moskow, president and CEO, Federal Reserve Bank of Chicago, and George Ranney, president and CEO, Chicago Metropolis 2020, invited the conference participants, including academics, policymakers, and other professionals, to share their views on the creative approaches to resolving congestion and inefficiency in transportation networks in the Chicago region and across the globe.

Congestion pricing

Kenneth Small, University of California—Irvine, presented the results of his

research (conducted with Clifford Winston and Jia Yan) on combining pricing policy with tollway access restrictions to reduce congestion. Their research drew upon a survey of driver experiences on State Route 91, a major east–west roadway in the Greater Los Angeles metropolitan area. Small and his colleagues found considerable variety among motorists in terms of how they assess the value of both reliable arrival times and time spent commuting. Accordingly, the researchers proposed charging drivers differently based on their willingness to pay for shorter, more predictable travel times.

Small and his colleagues found that a policy using two types of HOT lanes provided the optimal congestion pricing solution. These lanes (express and general use) would be free to carpools, but solo drivers would face tolls varying with lane type. The researchers argued that this solution balances toll revenue and consumer surplus—i.e., the difference between the maximum price consumers are willing to pay and the price they are charged. Importantly, it also offers the most equitable distribution of gains among all income groups, thus improving the policy's chances of acceptance by the public and policymakers.

Commenting on Small's proposal, Alex Anas, State University of New York at Buffalo, argued that policymakers would need to know drivers' household incomes and then use econometric models to set optimal tolls. In the absence of such data, uniform tolling of lanes might be the better option. He thought Small's proposal might be too complex to generate sufficient political support, even though it might be the most equitable. Anas also stressed the need to consider the pricing of particular highways in the context of a region's entire system, since traveler responses to congestion pricing might range from merely

Stephen Fitzroy, Fitzroy & Associates, described findings from a study in Portland, OR, addressing the effects of traffic congestion on that region's businesses and economy. He argued that congestion costs fall not only on commuters but also on those operating freight and service vehicles. The Portland study concluded that to avoid becoming "prisoners of congestion," businesses must make costly adjustments to their hours of employment and times of freight delivery and, in some instances, relocate operations outside of the metro region. Fitzroy noted that "the effects of congestion are eroding the

well below the maximum attainable level. McDonald estimated that the Eisenhower operates below maximum traffic flow over 50% of the time during rush hours. Various solutions include restricting access to the expressway, imposing time-of-day toll pricing, and setting up HOT and reversible lanes.

Privatization

The next topic for discussion was the types of institutional and governmental arrangements that might spur innovative road use policies. Robert Poole, Reason Foundation, presented research on the benefits and costs of public-private partnerships in the operation and management of public transportation systems. He suggested that privatization offers several advantages: a large pool of new capital, the ability to raise needed capital improvement funds, risk transfer from highly constrained state and local governments to private investors, multistate planning and coordination potential, and a more customer-oriented approach. In particular, a privately run tollway is more likely to raise tolls to maintain roads rather than defer expenditures, as political agencies have a tendency to do. To be sure, the public needs a high degree of protection in the concession agreement to avoid monopoly abuse by a private operator. Such assurances can be achieved through contracts that explicitly specify the length of contract term, toll rate caps, and performance requirements and include carefully crafted provisions for buyout, default, and contract amendment. Still, existing agreements have raised numerous concerns. Among them are the prevalence of foreign companies bidding on the projects and whether they will be subject to the same oversight as U.S. companies, the long lengths of the contract terms, lack of transparency regarding how governments use the huge upfront payments they receive, elevated future toll rates, the precedent of allowing land seizure by private companies, and the noncompete provisions of the agreements. Nonetheless, Poole saw the underlying case for privatization as strong, and predicted that privatization would see increasing acceptance.

The huge benefits of the revolution in supply chain management may be eroded if states and localities do not find effective ways to reduce road congestion.

changing lanes to using different routes, making fewer and shorter trips, or switching to public transit. In the longer run, pricing some highways without pricing others might have unintended consequences, such as driving jobs from the city to the suburbs.

Next, José Gómez-Ibáñez, Harvard University, moderated a panel on four cities' experiences with traffic congestion and toll pricing. Lee Munnich, University of Minnesota, described efforts to alleviate congestion on Interstate 394 in the Minneapolis-St. Paul area. There, a dedicated reversible toll lane was built that handles inbound traffic in the morning and outbound traffic in the evening, with the toll for accessing this dedicated lane fluctuating to ensure the free flow of traffic at any time. The scheme reduced overall congestion by 50% in peak times. Munnich highlighted the importance of political leadership in spearheading the effort, and he suggested that public support will be forthcoming if citizens can see tangible benefits from the outset. Moreover, such pricing projects are more likely to meet approval if some of the toll revenues are earmarked to support public transit systems.

significant progress that has been made in inventory management control," possibly weighing down productivity growth at the national level.

Yossi Berechman, City University of New York, argued that New York City Mayor Michael Bloomberg's proposed congestion pricing scheme for lower Manhattan would be ineffective in reducing congestion because studies have shown that demand for travel in New York City is unresponsive to price. Moreover, a considerable number of vehicles, especially government service vehicles, would be exempt from paying the toll. The toll is also likely to move businesses out of that congestion-priced zone. Berechman added that a demonstrated failure of a congestion pricing experiment in New York City might discourage other regions from trying this potentially worthwhile technique.

John McDonald, University of Illinois at Chicago, presented findings from his study of the Eisenhower Expressway in Chicago. He argued that the goal of tolling should be to increase throughput on the roadway. On the Eisenhower, which is unpriced at present, the number of cars is so high during rush hours that traffic volume pass-through falls

John Weicher, Hudson Institute, moderated a panel discussion on privatization in the Midwest. State Representative Randy Borrer, Indiana State Legislature, described Major Moves, the public-private partnership agreement that leased the Indiana Toll Road to a private institution. The lease agreement's upfront revenues of \$3.85 billion paid for existing toll road debt and fully funded Indiana's ten-year transportation plan. This plan included placing \$500 million in a perpetual trust fund, allowing only for interest earnings to be spent every five years for an additional major project. The 200-plus-page lease agreement covered the full range of issues that might arise over the course of the lease.

State Senator Don Harmon, Illinois State Legislature, shared his general questions and concerns about leasing the Illinois Tollway.¹ Although under a lease the state would receive a substantial influx of private funds, Harmon wondered why the Illinois Tollway was worth so much more in private hands, especially since it currently yields a negative yearly income. Will the state and its voters have seller's remorse? How would the sale affect job security and working conditions of public employees and unions? How would the burden of increased toll payments be borne by Illinois households of limited means? While elected officials must continue to study these questions, Harmon said his ideal political model includes a protective provision for state employees and a large upfront public revenue payment.

J. Fred Giertz, University of Illinois at Urbana-Champaign, described some of the broader issues associated with the leasing and sale of transportation assets. He accepted that the state of Illinois might want to sell the Illinois Tollway to enhance efficiency and to generate income in the short term. He also believed that the answer to Harmon's concern about the source of high private valuation was straightforward: The private institution believes it can do a better job operationally and would face fewer political constraints in raising tolls in the future. Still, Giertz acknowledged that without proper safeguards, it was unclear how a private

operator would price tolls. Would the private operator choose to enhance efficiency through toll pricing or would it strictly maximize profits?

Jim LaBelle, Chicago Metropolitan Area Transportation 2020, addressed a remaining issue concerning public-private partnerships. How would large upfront payouts to the state from the lease arrangement be managed? In particular, would the government be myopic in managing these payouts by squandering them to meet the current operational budget, thereby setting the stage for future budgetary strains? One assurance might be to bind revenue streams to capital improvements for transportation infrastructure throughout the state.

Transportation finance

In his keynote address, Martin Wachs, RAND Corporation, pointed out that the ideas of politicians and economists often do not agree when it comes to efficiency, allocation of resources to their highest-value uses, and fairness in funding transportation. Historically, user fees and motor fuel taxes have been used to fund highways, but recently, the revenue from these sources has been decreasing in real terms per vehicle mile driven, as the taxes have not kept pace with inflation and cars have become more fuel-efficient. The U.S. federal government has also begun shifting highway funding responsibilities to state and local governments. The short-term options available to increase roadway revenue include raising or indexing motor fuel taxes, issuing public debt, instituting a "dedicated" sales tax, increasing toll financing, establishing public-private partnerships, and leasing public assets. An innovative long-run option includes implementing a direct electronic charge based on roadway use, the energy efficiency of the vehicle, and the cost of the facility being used. The technology needed for this—global positioning system, or GPS—is already in use abroad and has been tested in the U.S.; however, privacy concerns are slowing its acceptance.

Payment mechanisms

Gene Amromin, Federal Reserve Bank of Chicago, presented the results of

research (conducted with Carrie Jankowski and Richard Porter) on the Illinois Tollway's transition to electronic real-time payments (I-PASS). For the benefits of switching to I-PASS to be fully realized, enough tollway users had to adopt the new technology without seeing the full benefits of I-PASS until the required highway infrastructure was put in place. The Illinois Tollway faced the classic chicken-and-egg network adoption problem. To solve it, two steps were taken. First, the Illinois Tollway launched a marketing campaign that included the distribution of I-PASS through a convenient chain of grocery stores and a publicity agreement with a local television station. Next, the toll price structure was reconfigured so that cash users had to pay twice what I-PASS users paid. The researchers found that higher-income groups adopted I-PASS earlier and to a greater extent. They also found that the change in price structure was especially effective in increasing I-PASS usage among low-income commuters, while the benefits of easier acquisition contributed to a marked increase in off-peak-hours use of the tollway among higher-income groups. In sum, the Illinois Tollway was successful in increasing I-PASS participation for all income groups, all times of day, and all days of the week.

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Daniel McMillen, University of Illinois at Chicago, discussed the Chicago Fed research, noting that I-PASS did not initially help increase efficiency because drivers still had to stop or slow down at the tollbooths until open road tolling was phased in. In suggesting directions for further research, McMillen proposed broadening the scope to include more analysis of the tollway's very significant leisure time use. He also noted that the research does not recognize the heterogeneity of commuters in the suburbs, many of whom have the option of taking convenient rail service. Overall, McMillen emphasized that the tollway experience shows that prices can generate intended results, so policymakers may wish to pursue more complex pricing options, such as time-of-day pricing.

A panel on the use of pricing mechanisms in public transportation was moderated by David Boyce, Northwestern University. The panel members discussed the adoption of new payment technologies by metro area transportation systems around the world. Eric Tai, former CEO, Octopus Cards, detailed Hong Kong's use of the Octopus Card—a contactless smart card that can be used on all transit services, as well as for purchases from a variety of merchants and for building access for participating schools and employers. In order to get widespread adoption of a smart card, it must be easy and intuitive to use, have quick transaction speeds, and be readily available and easy to recharge.

It is less clear whether such cards should be free or should have a deposit or service fee attached and also whether an open- or closed-loop system for these cards is more beneficial.

Greg Garback, Washington Metropolitan Area Transit Authority (WMATA), shared WMATA's experience with contactless payment. Riders are drawn to contactless payment by the flexibility and simplicity it provides. Customer convenience may be increased by putting contactless payment technology onto a device that they already carry, such as a general-purpose credit or debit card. On the downside, WMATA has had to manage its own privately issued cards, which it does not perceive as one of its core strengths. Ideally, it would like to get out of the payments business and accept cards issued by others, such as the major card associations and banks. WMATA is currently experimenting with a card issued by Citi, which would give it an open-loop system and avoid proprietary issues.

Michael Bolton, Pace Bus (suburban Chicago), addressed some of the challenges in getting consumers to adopt contactless payment technology. He stressed that Pace has found many lower-income riders prefer to buy weekly passes rather than smart cards because they fear that the loss of a smart card poses too great a financial risk. Many of these riders do not have bank accounts, which may inhibit them from using contactless payment. Many do, however, own cell phones, according

to a Pace survey. Since contactless payment is quicker and speed in entering and exiting a bus is important, Bolton suggested that the solution to these difficulties might be found by enabling "farebox" payments via cell phones. Agreeing with Garback, Bolton indicated that private payment providers would be more adroit at taking on this role. By itself, faster transit access, Bolton argued, would induce most transit users to adopt contactless payments.

Conclusion

In his closing remarks to the conference participants, William Testa, Federal Reserve Bank of Chicago, described how traffic congestion in urban areas across the U.S. puts a strain on regional economies as travel becomes more difficult and unreliable. Leisure travelers may be inconvenienced by the need to alter their travel decisions. Commuters must sacrifice more of their personal time and buffer uncertainty in arrival time. In addition, the huge benefits of the revolution in supply chain management may be eroded if states and localities do not find effective ways to reduce congestion. Since the costs of expanding infrastructure are increasingly prohibitive, transportation officials must look at emerging payment options for decreasing congestion on American roadways.

¹ In this article, both the system of roads and the Illinois State Toll Highway Authority (the organization responsible for the roads) are referred to as the Illinois Tollway.